NOTIFICATION.

No. 667.—The following report on the preventive inoculations against plague in the Khoja Community of Bombay, during the epidemic of 1897-98 by W. M. Haffkine, Esq., C. I. E., is published for general information :—

Total of Khojas inoculated during the epidemic of 1897-98, *and their average daily Strength.*—

His Highness the Agakhan's inoculation station at Maragaon was opened on the 24th December 1897. Up to the 20th April 1898, inclusive, 5,000 Khojas (exactly) were inoculated at that station, and 184 others were done in the Municipal Stations in the rest of the town, giving a total of 5,184 inoculated during the epidemic of 1897-98.

This number includes Khojas who had been inoculated already last year during the epidemic of 1896-97 and who presented themselves this year for re-inoculation. On the contrary, the Khojas inoculated last year, but not re-inoculated this year, are not included in the above number, and the analysis, which follows, does not refer to them.

The above number of Khojas was inoculated gradually. On the 27th December 1897 the opening day of the Station, 33 were operated upon ; on the 28th the number increased up to 66 ; on the 29th it increased up to 119 ; on the 30th up to 226 ; on the 31st up to 301 ; and so on. During the first 9 weeks the number was increasing steadily and on the last day of February it reached 4,719. During the other 7½ weeks the total number increased only by 465. Taking the daily strength of the inoculated during the whole period of 16½ weeks the average appears as 3,814. In the following comparative analysis the mortality in the inoculated is considered as having occurred not in 5,184 individuals, which is the number reached at on the last days of the operations, but in a number of 3,814 individuals only which is the *average* daily strength taking the above period as a whole.

The average daily Strength of the Khojas who remained uninoculated.

A census of the Khojas of Bombay taken in the beginning of 1898, by the Officers of the Khoja Jamat, under the orders of His Highness the Agakhan, showed the total community to be numbering 9,350 souls.

A certain number of families were, however, away when the census was being taken, on account of the epidemic, and their number could not be obtained accurately.

The following figures, are, therefore, taken as giving a safe foundation for all the necessary considerations.

The annual Khoja mortality in years free from plague, as registered in the burial ground books of the Jamat office, was—

In 1892	385
„ 1893	301
„ 1894	335
„ 1895	349

giving an average of 342 deaths in a year.

The mean mortality in the population of Bombay is close upon 35 per mille per annum.

Counting for the Khojas a mortality per mille per annum of 25 only, the average of 342 deaths a year gives a population of 13,680, which is likely to be higher than the actual number. During the epidemic of plague which preceded the 16½ weeks under consideration, the Khojas had 350 deaths in excess of their average mortality. The above number of persons in the community should therefore be reduced by 350, giving a population of 13,330.

This number, apparently exaggerated, which exceeds that found during the census by nearly 4,000 (by over ⅖) is adopted in the following calculations as representing the real Khoja population of Bombay, and the proportion of inoculated and uninoculated is accepted to be as follows :—

Average daily strength of inoculated ...	3,814,	(accurate number)
Average daily strength of uninoculated . .	9,516	(approximate, probably exaggerated number which includes also
Total ...	13,330	those inoculated last year and not re-inoculated during the epidemic of 1897-98).

By thus calculating upon an exaggerated strength of the uninoculated, the risk of exaggerating their death ratio during the epidemic under consideration is avoided.

Total number of deaths in inoculated and uninoculated which took place during the period under consideration.

During the 16½ weeks, between 27th December 1897 and the 20th April 1898, 184 deaths in all occurred in the Khoja Community. Of these six including two of plague, took place in Khojas inoculated in the epidemic of 1896-97 and not re-inoculated since; seven deaths, including three of plague, occurred in the 5,184 Khojas inoculated or re-inoculated this year; and 171 deaths occurred in the uninoculated Khojas.

Number of deaths from Plague in Khojas during the period under consideration :— In the years 1892 to 1896, while there was no plague in Bombay, the mortality during the same part of the year, between the 27th December and 20th April, was 131, 96, 100, 106 and 96 respectively, or on the average 105, in a normal population of 13, 680 individuals. In the reduced population of 13,330 as it stood at the beginning of the period under consideration, it should have been proportionately 102. The advent of the plague may have altered the course of the mortality, namely, the liability to death from other causes than plague may have been influenced by the fact that, during the plague year *preceding* the period under consideration, double the usual number of individuals had been carried away by death. The normal mortality must have been also reduced by a part of the community having left the city. Admitting, however, that, of the total number of 184, fully the usual proportion of 102 died of other causes than plague, there remain 82 deaths in excess of that number, which are attributable to plague alone. Sixty-four of this number were actually acknowledged as plague deaths by the relatives of the diseased or certified as such by the Khoja Jamat books. Of the 102 deaths attributable to other causes, four occurred in inoculated this year, four in the inoculated last year, and the rest 94, in uninoculated.

Of the 82 deaths attributable to plague, three occurred in inoculated this year, two in the inoculated last year, and 77 in uninoculated.

The names, sexes, and ages, and full addresses of all these 184 persons are given in the Appendices No. II and IV. These data have been very carefully verified, in all their details, from the Jamat and the inoculation documents, and by means of a minute house to house investigation carried out by Mons. Haffkine personally.

The distribution of deaths among the inoculated and uninoculated is as follows :—

9,516 uninoculated (probably exaggerated number) had 77 deaths from plague and 94 deaths from other causes.

3,814 inoculated this year (accurate number) had three deaths from plague and four deaths from other causes.

Admitting that among the uninoculated not more than the above proportion of deaths was due to plague, and supposing that the inoculated had remained, after inoculation, as susceptable to disease as were the uninoculated, they should have had according to their relative strength, 31 deaths from plague and 38 deaths from other causes.

The actual result is the most striking of all that have been observed up to now.

Among the 77 uninoculated who died of plague, there was one babe below 3 years of age, and four people above 60, giving a total of five deaths. Among the 94 uninoculated who died of other causes than plague, there were 33 deaths in babies of 3 years and below and 23 in people above 60, giving a total of 56 deaths.

The proportion of individuals of these two extremes of ages who were inoculated was very considerable, but smaller than their proportion among the uninoculated (see Appendix No. I). In order to eliminate this source of possible error, the five deaths from plague and 56 deaths from other causes, which occurred in uninoculated outside the age of 3 to 60 years, may be excluded from the comparison altogether; and after that the figures are still as follows:—

9,516 uninoculated (probably exaggerated number) had 72 deaths from plague and 38 deaths from other causes.

3,814 inoculated (accurate number) had 3 deaths from plague and 4 deaths from other causes.

The difference in the mortality in the uninoculated and inoculated Khojas.

This represents a difference of 89·7 per cent deaths from plague in favor of the inoculated part of the community, and of 73·3 per cent of deaths from what has been returned as other causes in favor of the same part of the community.

After making all allowances for inaccurate classification of deaths in the uninoculated group, with which the inoculated is being compared and admitting that a part of the excess of deaths in the uninoculated may be due to a certain number of sickly

people having abstained from inoculation, the result still contains an indication that, besides the protection against plague, this inoculation influences also favorably the resistance to certain other diseases than plague, fact with regard to which exact material is since sometime being accumulated in the Research Laboratory.

APPENDIX No. I.

Table permitting of a comparison between the inoculated and uninoculated groups of Khojas as regards their sexes and ages.

		Up to 3 years.	4 to 7 years.	8 to 15 years.	16 to 45 years.	46 to 60 years.	61 years and upwards.
Number of uninoculated Khojas as found in Bombay during a house-to-house visitation in March 1898.	Males ...	190	232	455	1,270	222	93
	Females ...	209	270	525	1,122	181	83
	Total ...	399	502	980	2,392	403	176
Number of inoculated Khojas registered at the Khosroo Lodge Inoculation Station between 27th December 1897 and 25th April 1898.	Males ...	133	254	698	1,239	153	48
	Females ...	133	281	644	1,166	239	25
	Total ...	266	535	1,342	2,405	392	73

Bombay City.

Plague cases.	Plague deaths	Total actual mortality from all causes	Total average mortality from all causes
31,083	27,533	1,01,008	...
76	66	624	562
31,159	27,599	1,01,632	...

Extract from the Diary of the Assistant Superintendent of Police, Kadur District, for the week ending Saturday 30th July 1898.

I passed through several villages which surpassed in cleanliness and sanitation any of the villages I had seen yesterday on my way to Hirenellur, Malleswara, Kodihalli, Bhootanhalli, Madapura and Gange; all command a supply of good drinking water from the wells. The villagers have taken great pains to improve the village gates, fences, chavadies and their dwelling houses are quite free from insanitary surroundings.

Remarks of the Deputy Commissioner.

Yes, most of the villages of the Kadur taluk round Ajjampur are most creditably looked after by the patels and are quite models in their way.

(Sd.) F. C.

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V. P. MADHAVA RAO,
Plague Commissioner in Mysore.